

Risks to surgeons and patients from HIV and hepatitis: guidelines on precautions and management of exposure to blood or body fluids

Joint Working Party of the Hospital Infection Society and the Surgical Infection Study Group

Concern is increasing among surgeons and operating theatre staff about the risks of occupational exposure to HIV and hepatitis viruses.¹⁻⁶ There has also been much public debate about the risk of patients who undergo invasive procedures acquiring these viruses from infected surgeons.⁷ Eminent bodies have published reports on the topic, yet views vary about the risk of transmission of HIV⁸⁻¹⁴ and the level of precautions appropriate to British hospitals.¹⁵⁻¹⁹

It was against this background that in October 1991 the Hospital Infection Society and the Surgical Infection Study Group convened a one day workshop at the Royal Society of Medicine, London, to review the degree of risk and prepare practical guidelines for surgeons, anaesthetists, and health care workers working in operating theatres. Its report forms the basis of the recommendations presented below.

The incidence of nosocomially acquired hepatitis far exceeds that of HIV infection. Hepatitis B is preventable with immunisation and hence is discussed first.

Hepatitis

Surgeons are at greatest risk of acquiring hepatitis B when operating on patients who are hepatitis e antigen positive. An estimated 40% of American surgeons are infected during surgery at some point during their lifetime; 4% become carriers.²⁰⁻²⁴ Without prophylaxis the risk may exceed 30% after a single exposure by needlestick or sharps injury to e antigen positive hepatitis B virus infected blood.²⁰ Unlike HIV there seems to be a significant risk of acquiring hepatitis B virus infection from exposure of skin or mucous membrane to blood from an e antigen positive carrier, but there is no evidence of aerosol transmission of hepatitis B virus. The risk of hepatitis B virus transmission to a health care worker who has been fully immunised and who has shown an immune response after vaccination is virtually zero.²²⁻²⁵ However, the duration of protection in a surgeon or other health care worker who has been immunised against hepatitis B virus but who has a level of antibody less than 100 IU is unclear.

Hepatitis B virus has been transmitted to anaesthetists and other health care workers in the operating theatres, and they—like surgeons—should be immunised and tested against hepatitis B virus.²⁶⁻²⁷

Hepatitis C virus may be transmitted to health care workers by needlestick or sharps injury and by inoculation of an open wound but the same general principles of prevention of transmission apply.²⁸⁻³⁰ Immunisation against hepatitis C virus is not yet available. Recommendations for staff involved in invasive procedures on patients are listed in box A.

IMMUNISATION

All surgeons should be immunised against hepatitis B. If their subsequent antibody level is greater than 100 IU they should be given a booster dose three to five

Box A: Precautions recommended for staff

Invasive procedures in all patients

- Have vaccination against hepatitis B
- Cover all cuts and abrasions with waterproof dressings
- Do not pass sharps hand to hand
- Do not use hand needles
- Do not guide needles with fingers
- Do not resheath needles
- Dispose of all sharps safely into approved containers
- Put disposables and waste into yellow clinical waste bags for incineration

Additional precautions when caring for known HIV and hepatitis B virus positive and high risk patients

- Consider non-operative management
- Remove unnecessary equipment from theatre
- Observe highest level of theatre discipline
- Have only experienced surgeons and health care workers in theatre
- Use: double glove, high efficiency masks, eye protection, boots, impervious gowns, closed wound drainage
- Use disposable anaesthetic circuitry or appropriate method of decontamination (see text)
- Disinfect theatre floor with hypochlorite (refer to local policies)

years later. Non-converters should be vaccinated again. If they still fail to convert they should be tested for hepatitis B e antigen. If positive they should avoid invasive procedures, although they may resume these when no longer e antigen positive. Non-converters who are hepatitis B e antigen negative must be made aware that they are still at risk from hepatitis B virus and should take particular precautions. These may include hepatitis B immunoglobulin prophylaxis in the event of a needlestick or sharps injury. Health care workers with antibody levels below 100 IU may not have long lasting immunity. Health care workers whose level is 50-100 IU should receive a booster dose of hepatitis B vaccine within one year. For those with levels of 10-50 IU a further booster dose should be given immediately.

Some employing authorities have begun testing surgeons and health care workers who may be involved in invasive procedures for hepatitis. If found to be e antigen positive carriers they are not permitted to participate in such surgery. The Medical Defence Union regards as indefensible the participation by surgeons in invasive procedures when they know they are e antigen positive.³¹

TRANSMISSION FROM HEALTH WORKERS TO PATIENTS

Outbreaks of hepatitis among patients where an infected surgeon was the source continue to be re-

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ported. In five series with study groups of 123 to 1020 patients having gynaecological or cardiothoracic operations rates of transmission ranged from 0.9% to 9.0% of cases, anicteric forms of the disease outnumbering icteric by roughly 2.4 to one.³²⁻³⁶ In all cases these outbreaks were associated with carriage of e antigen by the surgeon, who therefore had to stop doing operations. The types of elective surgery which carry an increased risk of transmission of hepatitis B virus include gynaecological, major abdominal, cardiovascular, and orthopaedic, where injuries with suture needles and other sharp instruments or exposure to large amounts of blood are more likely to occur.

The risk of transmitting hepatitis B virus from patients to surgeons and from surgeons to patients is much higher than for HIV. However, hepatitis is preventable and, even if transmission occurs, rarely fatal.

HIV

NEEDLESTICK AND SHARPS INJURIES

Prospective surveys show the risk of HIV seroconversion after a single needlestick or sharps injury involving known HIV infected blood to be approximately 0.36% (table I).^{13, 37} By August 1992 no sero-

TABLE 1—Rate of HIV transmission by accidental inoculation of infected blood from occupational percutaneous injury. Summary of 15 prospective and cross sectional studies of exposed health care workers

No of initial and follow up serum samples	No of follow up serum samples only	No showing HIV seroconversion	No from people with presumptive occupational HIV infection
2374	101	6	3

Overall rate = nine in 2475 (0.36%), or one in 275 cases (upper limit of 95% confidence interval = 0.69%).

Source: Communicable Disease Surveillance Centre.

conversion after an injury from a suture needle or other solid needle used in the operating theatre had been reported. Nevertheless, the assumption that a risk theoretically exists is reasonable. HIV is less transmissible than hepatitis B virus, requiring hollow needles and larger volumes of blood—which are particularly likely to be encountered on special units such as intensive therapy units and in accident and emergency departments.

SKIN AND MUCOUS MEMBRANE EXPOSURE

Intact skin and mucous membranes are an important defence against HIV. In 1987 three health care workers who had eczema or dermatitis and who did not observe barrier precautions were exposed to HIV infected blood and acquired HIV without a sharps injury.³⁸ However, no further, similar incident in hospital has been documented. In addition, prospective surveys of 900 exposures to infected blood in 435 health care workers showed no seroconversion.³⁹ Although the risk of HIV transmission as a consequence of exposure of skin or mucous membranes to HIV infected blood is probably not zero, it is considerably less than the risk associated with a blood inoculation injury from a hollow needle.

TRANSMISSION FROM PATIENTS TO HEALTH WORKERS

Estimates of the risk of surgeons acquiring HIV during operations have been based on the prevalence of HIV in a given geographical area, the type of surgery, the incidence of needlestick or sharps injury, and the number of years that surgeons are expected to work.^{13, 40-44} In most reports of lifetime risks to surgeons there has been no clear differentiation between injuries likely to be sustained with suture needles or other solid instruments and hollow needle or major laceration

TABLE 2—HIV transmission from HIV positive surgeons to patients during intraoperative exposure

Surgical specialty	No of patients exposed	No of patients tested	No of patients infected with HIV
Urology ⁴⁵	400	—	—
General surgery ⁴⁶	1804	75	0
General surgery ⁴⁷	399	76	0
General surgery ⁴⁸	2160	616	1*
Dentistry ⁴⁹	> 1700	732	5 (+2)†
Dentistry ⁵⁰	163	130	0
Obstetrics and gynaecology‡	1215	519	0

*Intravenous drug abuser having surgery for persistent lymphadenopathy.

†Two patients had other risk factors, and molecular biology of infecting virus was different.

‡Crawshaw, personal communication.

injuries. There is no evidence that HIV is transmitted by aerosols. Even in the experimental model reported by Johnson and Robinson there was no evidence of aerosol transmission when power tools were used, as in orthopaedic surgery.⁴⁵ The experiments used an unrealistic test model, in which air was extracted only a few inches away from instruments which had been contaminated with simulated infected blood containing massive doses of HIV. Blood splashing was inevitable, and it is doubtful whether the experiment had any relevance to the real situation in the operating theatre. A serological survey of over 3000 orthopaedic surgeons in the United States found only two who were HIV positive; both had personal risk factors.⁴⁶

TRANSMISSION FROM HEALTH WORKERS TO PATIENTS

There is a single report that a Florida dentist with AIDS transmitted HIV to five patients. The mechanism of this transmission remains speculative as the dentist died before his techniques could be verified. It is not possible to quantify the risk of transmission from health care worker to patient, but it must be extremely low given that large volumes of blood from the health care worker would need to enter the patient's bloodstream. The risk is probably much lower than the risk of transmission from patient to health care worker.

By August 1992 there was no report of transmission of HIV from an infected surgeon or other member of the operating theatre staff to a patient. Estimates of the risk of such transfer range from 1:48 000 to 1:1 000 000.^{13, 49-54} In studies of patients who had been operated on by surgeons with HIV infection the few patients who were found to be HIV positive had other, non-hospital associated risk factors (C Crawshaw, personal communication)⁵⁵⁻⁵⁹ (table II).

PRECAUTIONS FOR INFECTED HEALTH WORKERS

The General Medical Council recommends that all staff who think that they have been at risk of infection should be confidentially tested and that where HIV or hepatitis B virus infection is detected special counselling and expert advice should be sought.⁶⁰ If the health care worker is e antigen or HIV positive he or she should stop performing invasive procedures (see box B). The same message is contained in guidelines

Box B: Invasive procedures to be avoided by e antigen or HIV positive health workers

- Surgical entry into tissues, cavities, or organs
- Repair of major traumatic injuries
- Cardiac catheterisation and angiography
- Vaginal or caesarean deliveries or other obstetric procedures during which bleeding may occur
- Manipulation, cutting, or removal of any oral or perioral tissue, including tooth structures, during which bleeding may occur

from the Department of Health⁶¹ and is regarded as mandatory by the Medical Defence Union.³¹

PRECAUTIONS IN OPERATING THEATRES

Operating theatres should have a policy on precautions against the risk of HIV transmission, which should be based on local assessment (see box C) and should contain precautions appropriate to the care of all patients and to high risk patients (box A).

Factors affecting the policy may be conveniently considered from three aspects. The first involves assessment of the prevalence of HIV in a given district, and information may be forthcoming from the local consultant in communicable disease control or genitourinary physicians. Several anonymous surveys are in progress to assess the prevalence of HIV infection in hospitalised patients in different parts of Britain, antenatal clinics, and genitourinary clinics. At present most HIV infected patients are cared for in a few hospitals in London, Edinburgh, and one or two other cities (table III), but this may soon change. Additional precautions in operating theatres are not considered universally necessary in areas of low risk and prevalence—which includes most of the United Kingdom.¹⁵

TABLE III—Distribution of care of 5451 AIDS cases reported from 381 hospitals: United Kingdom to end December 1991

Cumulative No of AIDS patients reported	No of hospitals reporting this number of AIDS patients
1 or 2	212
3-10	100
11-50	49
51-100	6
101-199	9
≥ 200	4

Source: Communicable Disease Surveillance Centre and CD(S)U.

The second aspect relates to the age, sex, personal behaviour, history of travel, and area of birth of patients, which may predispose them to HIV infection.

The third aspect concerns the type of surgery. In all geographical areas the risks are higher during emergency major surgery whether associated with trauma, fractures, burns, or abdominal conditions because the scale of exposure to blood and body fluids by the

Box D: Ways to avoid exposure to HIV and hepatitis in all departments

- Apply basic hygienic practices with regular hand-washing
- Cover existing wounds and skin lesions with water-proof dressings
- Take simple protective measures to avoid contamination of person and clothing with blood
- Protect mucous membrane of eyes, mouth, and nose from blood splashes
- Take care to prevent wounds, cuts, and abrasions in presence of blood
- Avoid use of sharps whenever possible
- Ensure safe handling and disposal of sharps
- Clear spillages of blood promptly and disinfect surfaces
- Ensure safe disposal of contaminated waste

operating theatre staff is increased and the HIV status of the patient unknown. Elective vascular, orthopaedic, major abdominal, and gynaecological surgery may be more hazardous than other forms of surgery since the risk of injury is increased during work in areas of difficult access or with power tools.

All patients

The basic hygienic precautions recommended to all health care workers to avoid exposure to HIV and hepatitis B are listed in box D. Those more specific to the operating theatre are given in box A and include safer surgical techniques.⁶²⁻⁶⁵ In addition, whenever possible moves should be made towards using minimally invasive, endoscopic surgical techniques, which reduce the risk of eye contamination by blood and body fluids. Other precautions recommended for all patients, irrespective of risk, are designed to avoid blood, body fluids, and tissues contaminating the skin or mucous membranes of health care workers, although these will have a more easily detectable effect in the transmission of hepatitis B virus than HIV. All cuts and abrasions should be covered with a waterproof dressing. If the health care worker has extensive eczema on the hands

Box C: Policy for operating theatres

Risk factors

Personal risk factors

- (1) Homosexual or bisexual males
- (2) Intravenous drug abusers
- (3) Persons who have had penetrative sexual contact with others from areas of high HIV prevalence
- (4) Persons who have received unscreened blood transfusions in areas of high HIV prevalence
- (5) Haemophilic patients who have received untreated blood products
- (6) Known HIV positive patients
- (7) Sexual partners of any of the above
- (8) Children born to seropositive mothers

Geographical factors

- (1) Local—where prevalence of HIV infection is known to be high
- (2) International—Sub-Saharan Africa; other countries with known high prevalence of HIV

Surgical factors

- (1) Emergency operations—major abdominal and orthopaedic operations; burns
- (2) "High risk" elective operations—major abdominal, gynaecological, and cardiovascular operations; orthopaedic operations involving use of power tools

Recommended precautions in operating theatres

Full precautions are indicated where risk is known or suspected

Local "high" prevalence should be defined by individual hospitals but greater than 5% should justify full precautions

Full precautions should be taken

Full precautions should be taken except in areas of low HIV prevalence

then participating in invasive procedures may be contraindicated because of the risk of transmitting various pathogenic organisms, including HIV.

High risk patients

Additional precautions are recommended for high risk patients, including those with known or suspected HIV or hepatitis B virus infection. All major abdominal, trauma, fracture, burns, vascular, and gynaecological surgery should be considered as high risk, as should orthopaedic surgery when power tools are used. However, in areas of low prevalence of HIV these additional precautions may not be considered necessary.^{15 62 66 67}

Box A lists the extra precautions recommended for high risk patients. When an operation is unavoidable the highest level of theatre discipline should be maintained, particularly when patients have known or suspected HIV infection. Inexperienced personnel should be excluded from the theatre—they can be taught safer surgery when operating on other patients. Double gloving decreases the chance of hand contamination, but it may be necessary to change gloves frequently if the outer gloves get damaged. Because of the loss of sensitivity double gloving is advocated only for high risk patients. Some workers advocate a third layer of linen gloves worn between two rubber gloves for particularly hazardous surgery,⁶³ and gloves which have woven metal threads to prevent scalp injuries are now available.

Goggles or other eye protectors are recommended only for operations on high risk patients. Special helmets such as are worn for the Charnley body exhaust system are not required. Boots should be worn, and the gown should extend below the upper level of the boots. Gowns should be water impermeable. If such gowns are not available waterproof sleeves and a plastic disposable apron should be worn beneath the gown. Drapes must be disposable and must be laminated with a plastic core to prevent strikethrough.

All unnecessary equipment should be removed from the operating theatre to reduce the amount of decontamination required after the operation. Closed wound drainage is recommended when drainage is considered essential. The patient's skin should be cleaned of blood at the end of the operation, and a wound dressing that will contain the exudate within an impervious outer covering should be used. After the operation all linen and theatre clothing should be sealed in a water soluble plastic bag and double bagged before being sent to the laundry labelled as infected linen.

There is no need to place high risk patients at the end of the operating list, though before the next operation the theatre floor should be disinfected with hypochlorite or other chlorine releasing agent (1000 ppm available chlorine). Plastic aprons and disposable gloves should be worn by all health care workers when handling used dressings, instruments, and linen as well as when cleaning and disinfecting equipment and surfaces. Surfaces splashed with blood should be disinfected with hypochlorite solution (10 000 ppm available chlorine) or equivalent powder or granules. Waste material should be sealed in a yellow plastic bag and incinerated.

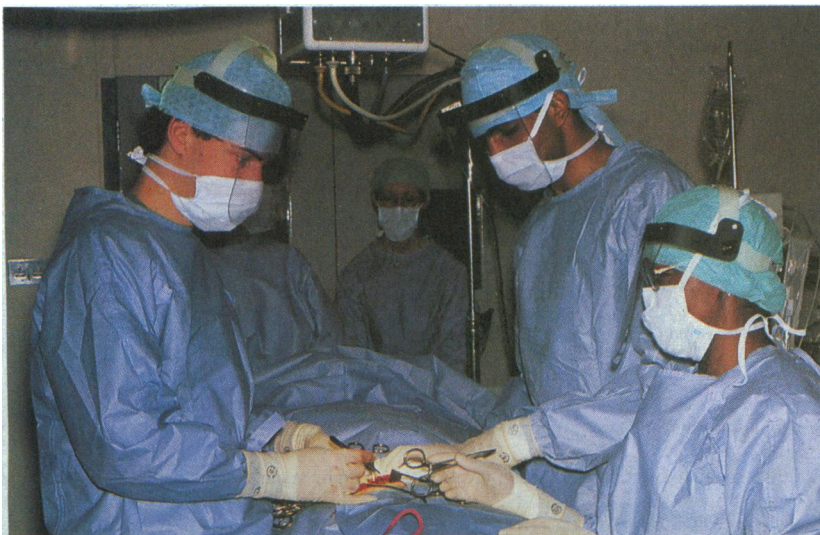
Anaesthetic systems—There is no evidence that viral infections can be spread by anaesthetic equipment, including ventilator tubing,⁶⁸ but it is sensible to adopt a hygienic approach to breathing systems. If the risk of infection is considered significant there are at least three possible approaches. Firstly, disposable circuitry could be used. In view of the cost and lack of convincing data regarding transmission of HIV by this mode this approach should probably be restricted to high risk cases or high risk geographical areas. Secondly, heat and moisture exchange filters with good filtration properties could be used and the filters changed between cases.⁶⁹ There are several potential, although unproved, benefits in using these filters with controlled ventilation but there is a potential problem with using them for spontaneous breathing because of the size of the head space. Thirdly, ventilator components may be decontaminated by autoclaving, low temperature steam, or in a washer-disinfector. To avoid the need to autoclave ventilator components the filter should be placed between the expiratory limb of the circuit and the ventilator itself. This should be adequate to prevent contamination of the ventilator.

Screening patients for HIV

In areas of high prevalence of HIV or hepatitis all patients admitted for emergency surgery should be considered high risk. Preoperative screening should be considered only for patients undergoing elective surgery. Emphasis should be placed on non-serological screening methods to identify patients who have an increased risk of HIV infection by taking a careful history to elucidate potential risk factors (box C).⁶⁹

The main non-serological screening methods entail taking a routine history and including questions about sexual behaviour, drug abuse, travel to HIV endemic areas, etc. Questions relevant to hepatitis B virus should also be asked. Occasionally physical signs such as needle puncture sites may help to detect high risk behaviour. A tactfully worded questionnaire⁴⁰ could be made available but has not yet been shown to be widely practicable.

Many surgeons think they would take greater care in the operating theatre when operating on a high risk patient and believe this justifies screening. However, screening antibody tests are expensive. A study from San Francisco in a hospital experienced with AIDS patients and in which universal precautions were implemented showed that knowing the HIV status of the patient made no difference to the incidence of sharps injury.⁴² The circumstances are likely to be very different in a hospital in an area of the United Kingdom where the prevalence of HIV is very low. If HIV antibody screening tests are to be done this should only be after counselling and after informed consent has been obtained. The other reason to screen patients for HIV is to benefit clinical management. Early detection of asymptomatic or mild clinical HIV infection allows prompt treatment with zidovudine and prophylaxis against pneumocystis infection when a critically low CD4 lymphocyte count occurs. Counselling of HIV



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The highest level of theatre discipline is required when operating on patients infected with HIV

positive patients may also encourage safer sex and other modifications of personal behaviour to prevent HIV transmission.⁶⁹

HIV ANTIBODY TESTS

HIV antibody tests are required for infection control before surgery in a transplant donor and before blood, sperm, or milk donation in accordance with Department of Health guidelines. Otherwise HIV antibody tests are recommended only on clinical grounds for high risk patients and only with informed consent after counselling.

HEPATITIS B VIRUS ANTIGEN TESTS

Most patients who are at high risk of HIV infection are also at high risk of hepatitis B virus infection. The main difference relates to the place of birth, the likelihood of hepatitis B virus infection varying in different parts of the world. Hepatitis B virus antigen tests should be performed on high risk patients who are undergoing major abdominal, orthopaedic, or gynaecological surgery and should be considered for all patients having open heart surgery, where the risks to health care workers of blood exposure are considerable. The need for screening is reduced when all health care workers participating in the operation are effectively vaccinated against hepatitis B virus. These tests are also mandatory for renal dialysis and transplant recipients.

Screening surgeons

Staff who undertake invasive procedures on patients should arrange to have a confidential HIV antibody test if they consider that they are at increased risk of HIV infection.⁶⁰ In addition, prospective surgical trainees and new surgical employees should be screened for hepatitis B virus. If they are found to be e antigen positive they should be counselled to pursue a non-surgical career unless they lose their e antigen carrier status spontaneously or after receiving interferon. All health care workers engaged in invasive procedures, including those in the operating theatre, accident and emergency department, labour suites, or genitourinary medicine departments, should receive a course of hepatitis B vaccination with post-vaccination serological checks. Most authorities now question the need for prevaccination antibody testing, but each hospital must determine its own policy.⁷² Surgeons in current employment should have detectable antibodies to hepatitis B virus (> 100 IU) or have received a course of hepatitis B vaccination.⁷⁰ Studies in the United States show that over 40% of surgeons have not received hepatitis B vaccination.⁷¹

Insurance companies have indicated that they will not penalise health care workers who have serological tests for HIV or hepatitis B virus merely because of their occupations, but there will be implications if the result is positive.³¹

Managing inoculation incidents in theatre

An inoculation incident occurs when a break in the skin sufficient to cause bleeding is contaminated with blood or tissue fluid or there is a splash of blood or tissue fluid into the mouth or conjunctiva. The greatest risk is probably presented by deep injury with a contaminated hollow needle. Although other types of incident cannot be ignored, injuries with solid sharps (for example, suture needles) and mucosal splash rarely cause HIV transmission. Most minor sharps injuries, without bleeding, do not warrant detailed investigation or prophylactic measures.

Surgeons (defined as operating surgeons, assistants, and scrub nurses) with existing cuts or abrasions on

their hands should cover these with a sterile waterproof dressing after scrubbing. If it is essential that a surgeon with more widespread skin damage should operate he or she should wear double gloves. After a needlestick injury the surgeon should stop operating as soon as the operating conditions allow, remove gloves, and wash the area with soap and water or surgical detergent scrub, as appropriate. The wound should be encouraged to bleed and the surgeon should cover it with a sterile waterproof dressing before regloving and completing the operation (unless someone else can take over).

If a needlestick or sharps injury has occurred during an operation on a high risk patient or in some other setting where the surgeon is concerned about the acquisition of HIV or hepatitis B virus—particularly injuries with hollow needles and large volumes of blood—he or she should seek professional advice. Such advice should be available from the occupational health doctor but may be from the AIDS physician, medical microbiologist, or another senior colleague. After assessing the risk the doctor consulted should provide counselling and be involved in the arrangements to check the serological status of the source patient after counselling and with consent. In addition, he or she may request blood from the surgeon for storage for possible later testing and suggest enrolment in the surveillance programme organised by the Public Health Laboratory Service Communicable Disease Surveillance Centre and Association of Medical Microbiologists.⁷²

HEPATITIS B

If the source patient is hepatitis B virus positive (or refuses to be tested) a non-immunised surgeon should start a course of active immunisation. The non-immunised surgeon, or one who has not responded to previous immunisation, will require passive immunisation with hepatitis B immune globulin. If the surgeon has already received a course of vaccine his or her antibody level should be checked; if this is below 100 IU a booster dose of vaccine should be given. Exceptionally, where the titre is less than 10 IU passive immunisation may be needed in addition.

HIV

If the patient proves to be HIV positive (or refuses to be tested) the surgeon should be tested for HIV antibody at three and six months. He or she should be counselled to utilise safer sex techniques and to use condoms until the HIV test has been shown to be negative at three months. The surgeon should also be advised not to give blood for transfusion etc until the final test is done at 12 months.⁷³

If the patient is unconscious and likely to remain so for the next 24 hours and there is a high risk the counsel of a senior clinician other than from the team involved with the care of the patient should be sought before HIV antibody testing is undertaken without consent.

Because there is only a small risk that the surgeon will acquire HIV from the incident, and an even smaller likelihood that he or she will transmit HIV to a subsequent patient, the surgeon should continue to operate during this period. However, if any influenza-like illness that might represent seroconversion occurs after the incident the surgeon must stop invasive procedures and have an antibody test.⁷⁰⁻⁷⁴

ZIDOVUDINE

Zidovudine is the only drug considered to offer the possibility of modifying the risk of infection with HIV after an inoculation incident.⁷⁴⁻⁷⁵ There are reports of alleged failure of zidovudine prophylaxis in humans,⁷⁶⁻⁸¹ but it is difficult to establish that prophylaxis has been successful, and a controlled trial in

humans will not now be undertaken. The evidence from animal experiments is not encouraging.⁸¹ No major toxicity has ensued from prophylactic use of zidovudine but minor reactions including nausea and anaemia have occurred. The long term toxic effects are unknown.⁸¹ On this basis all surgeons should consider whether they would wish to take zidovudine in the event of an injury that presents risk.

As the best hope of effectiveness of zidovudine is provided by early administration (within two hours) consideration should be given to providing "starter packs" of zidovudine 1g orally in the operating theatre. This would allow surgeons who elect to have zidovudine to receive the first dose shortly after the incident. The surgeon who does this should seek early counselling to decide whether to continue to take the full course of zidovudine. If the patient proves to be HIV positive (or refuses to be tested) and the surgeon elects to continue with the course zidovudine 250mg four hourly (five doses per day) should be given for 28 days and the peripheral blood count checked every two weeks. Zidovudine should be discontinued if the patient proves to be HIV antibody negative unless the patient is clearly at high risk of having acquired HIV.

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- 1 Bird AG, Gore SM, Leigh-Brown AJ, Carter DC. Escape from collective denial: HIV transmission during surgery. *BMJ* 1991;302:351-2.
- 2 Wastell C. AIDS and the surgeon: an update. In: *Risks and complications. The patient and surgeon in theatre*. Oxford: The Medicine Group (UK), 1989:9-10.
- 3 Mandelbrot DA, Smythe WR, Norman SA, Martin SC, Arnold RM, Talbot GH, et al. A survey of exposures, practices and recommendations of surgeons in the care of patients with human immunodeficiency virus. *Surg Gynecol Obstet* 1990;171:99-106.
- 4 Royle JP, Syme RRA. Strategy for AIDS. *Aust NZ J Surg* 1990;60:567-9.
- 5 McNicholas TA, Jones DJ, Sibley GNA. AIDS: the contamination risk in urological surgery. *Br J Urol* 1989;63:565-8.
- 6 Heald RJ. The dog in the night time. *Br J Surg* 1991;78:3-5.
- 7 Schaffner W. Surgeons with HIV infection: the risk to patients. *J Hosp Infect* 1991;18(suppl A):191-6.
- 8 Royal College of Surgeons of England. *A statement by the college on AIDS and HIV infection*. London: RCSEngl, 1990.
- 9 Royal College of Surgeons of Edinburgh. *Statement to fellows on HIV infection and AIDS*. Edinburgh: RCSEdin, 1990.
- 10 British Orthopaedic Association. *Guidelines for the prevention of cross-infection*

- between patients and staff in orthopaedic operating theatres with special reference to HIV and the bloodborne hepatitis viruses. London: BOA, 1991.
- 11 Royal College of Obstetricians and Gynaecologists. *Statement on HIV*. London: RCOG, 1990.
- 12 United Kingdom Department of Health. *Guidance for clinical health workers: protection against infection with HIV and hepatitis viruses. Recommendations of the expert advisory group on AIDS*. London: HMSO, 1990.
- 13 Working Group of the Royal College of Pathologists. *HIV infection: hazards of transmission to patients and health care workers during invasive procedures*. London: RCP, 1992.
- 14 Gerberding JL, Littler C, Tarkington T, Brown A, Schecter WP. Risk of exposure of surgical personnel to patients' blood during surgery at San Francisco General Hospital. *N Engl J Med* 1990;322:1788-93.
- 15 Gazzard BG, Wastell C. HIV and surgeons. *BMJ* 1990;301:1003-4.
- 16 Hospital Infection Society Working Party. *Recommendations on acquired immune deficiency syndrome*. *J Hosp Infect* 1990;15:7-34.
- 17 Occupational infection among anaesthetists. *Lancet* 1990;336:1103.
- 18 Porteous MJ. Operating practices of and precautions taken by orthopaedic surgeons to avoid infection with HIV and hepatitis B during surgery. *BMJ* 1990;301:176-9.
- 19 Shanson DC. Current surgical controversies over HIV infection. *J Hosp Infect* 1991;17:77-81.
- 20 Werner BG, Grady GF. Accidental hepatitis B surface antigen positive inoculations. Use of e antigen to estimate infectivity. *Ann Intern Med* 1982;97:367-9.
- 21 West DJ. The risk of hepatitis B infection among health professionals in the United States: a review. *Am J Sci* 1984;287:26-33.
- 22 Hu DJ, Kane MA, Heymann DL. HIV, hepatitis B virus and other blood borne pathogens in health care setting: a review of risk factors and guidelines for prevention. *Bull World Health Organ* 1991;69:623-30.
- 23 Shanson DC. Hepatitis B outbreak in operating theatre and intensive care unit staff. *Lancet* 1980;ii:596.
- 24 Lemmer JH. Hepatitis B as an occupational disease of surgeons. *Surg Gynecol Obstet* 1984;159:91-100.
- 25 Dienstag JL, Ryan DM. Occupational exposure to hepatitis B virus in hospital personnel: infection or immunisation? *Am J Epidemiol* 1982;115:26-39.
- 26 Centers for Disease Control. Protection against viral hepatitis: recommendations of the immunisation practices advisory committee (ACIP). *MMWR* 1990;39:1-26.
- 27 Brattebo G, Wisborg T. Occupational infection among anaesthetists. *Lancet* 1990;336:1456.
- 28 Seef LB. Hepatitis C from a needlestick injury. *Ann Intern Med* 1991;115:411.
- 29 Kiyosawa K, Sodeyama T, Tanaka E, Nakano Y, Furuta S, Nishioka K, et al. Hepatitis C in hospital employees with needlestick injuries. *Ann Intern Med* 1991;115:367-9.
- 30 Klein RS, Freeman K, Taylor PE, Stevens CE. Occupational risk for hepatitis C virus infection among New York dentists. *Lancet* 1991;338:1540-2.
- 31 Tomkins C. HIV transmission from doctors to patients. *Journal of the Medical Defence Union* 1991;3:50.
- 32 Public Health Laboratory Service. Collaborative study report. Acute hepatitis associated with gynaecological surgery. *Lancet* 1980;i:1-6.
- 33 District Control of Infection Officer. Acute hepatitis B associated with gynaecological surgery. *J Hosp Infect* 1987;9:34-8.
- 34 Welch J, Webster M, Tilzey AJ, Noah ND, Banatvala JE. Hepatitis B infections after gynaecological surgery. *Lancet* 1989;ii:205-7.
- 35 Prentice MB, Flower AJE, Morgan GM, Nicholson KG, Rana B, Firmin RK, et al. Infection with hepatitis B virus after open heart surgery. *BMJ* 1992;304:761-4.
- 36 Heptonstall J. Outbreaks of hepatitis B virus infection associated with infected surgical staff. *Communicable Disease Report* 1991;1:R81-5.
- 37 Henderson DK, Fahey BJ, Willy M, Schmitt JM, Carey K, Koziol DE, et al. Risk for occupational transmission of human immunodeficiency virus type 1 (HIV-1) associated with clinical exposures. *Ann Intern Med* 1990;113:740-6.
- 38 Centers for Disease Control. Update: human immunodeficiency virus infections in health care workers exposed to blood of infected patients. *MMWR* 1987;36:285-9.
- 39 Henderson DK. HIV-1 in health care setting. In: *Principles and practice of infectious diseases*. Edinburgh: Churchill Livingstone, 1990:2221-36.
- 40 Guillou PJ. HIV and the surgeon—a cause for concern? *Surgery* 1992;10:93-4.
- 41 Lowenfels AB, Wormser GP, Jain R. Frequency of puncture injuries in surgeons and estimated risk of HIV infection. *Arch Surg* 1989;124:1284-6.
- 42 Gerberding JL. Occupational HIV transmission: issues for health care providers. In: Sande MA, Volberding PA, eds. *The medical management of AIDS*. Philadelphia: Saunders, 1990:57-84.
- 43 Panilio AL, Foy DR, Edwards JR, Bell DM, Welch BA, Parrish CM, et al. Blood contacts during surgical procedures. *JAMA* 1991;265:1533-7.
- 44 Howard RJ. Human immunodeficiency virus testing and the risk to the surgeon of acquiring HIV. *Surg Gynecol Obstet* 1991;171:22-6.
- 45 Johnson GK, Robinson WS. Human immunodeficiency virus-1 (HIV-1) in the vapors of surgical power instruments. *J Med Virol* 1990;33:47-56.
- 46 Centers for Disease Control. Preliminary analysis: HIV sero-survey of orthopaedic surgeons. *MMWR* 1991;40:309-12.
- 47 Centers for Disease Control. Possible transmission of HIV to a patient during an invasive dental procedure. *MMWR* 1990;39:489-93.
- 48 Centers for Disease Control. Update: transmission of HIV infection during invasive dental procedure—Florida. *MMWR* 1991;40:378-81.
- 49 Henderson DK. Zeroing in on the appropriate management of occupational exposures to HIV-1. *Infection Control and Hospital Epidemiology* 1990;11:175-7.
- 50 Rhame FS. The HIV-infected surgeon. *JAMA* 1990;264:507-8.
- 51 Crawshaw SC, West RJ. HIV transmission during surgery. *BMJ* 1991;303:580.
- 52 Lowenfels AB, Wormser G. Risk of transmission of HIV from surgeon to patient. *N Engl J Med* 1991;325:888-9.
- 53 Leentvaar-Kuijpers A, Dekker MM, Coutinho R, Dekker EE, Keeman JN, Ansink-Schipper MC. Needlestick injuries. Surgeon and HIV risks. *Lancet* 1990;335:546-7.
- 54 De Clerq A, Oeyen L. HIV and surgeons. *BMJ* 1991;302:51.
- 55 Sacks JJ. AIDS in a surgeon. *N Engl J Med* 1985;313:1017-8.
- 56 Armstrong FP, Miner JC, Wolfe WH. Investigation of a health care worker with symptomatic human immunodeficiency virus infection: an epidemiologic approach. *Milit Med* 1987;152:414-8.
- 57 Porter JD, Cruickshank JG, Gentle PH, Robinson RG, Gill ON. Management of patients treated by surgeon with HIV infection. *Lancet* 1990;335:113-4.
- 58 Mishu B, Schaffner W, Horan JN, Wood LH, Hutcheson RH, McNabb PC. A surgeon with AIDS: lack of evidence of transmission to patients. *JAMA* 1990;264:467-70.

- 59 Comer RW, Myers DR, Steadman CD, Carter MJ, Rissing JP, Tedesco FJ. Management considerations for an HIV positive dental student. *J Dent Educ* 1991;55:187-91.
- 60 General Medical Council. *HIV: the ethical considerations*. London: GMC, 1988.
- 61 United Kingdom Department of Health. *AIDS—HIV infected health care workers. Occupational guidance for health care workers, their physicians and employers. Recommendations of the expert advisory group on AIDS*. Lancashire: Health Publications Unit, 1991.
- 62 Dudley HA, Sim A. AIDS: a bill of rights for the surgical team? *BMJ* 1988;296:1449-50.
- 63 Gerberding JL, Schechter WP. Surgery and AIDS: reducing the risk. *JAMA* 1991;265:1572-3.
- 64 Sim AJW. Towards safer surgery. *J Hosp Infect* 1991;18(suppl A):184-90.
- 65 Raahave D, Bremmelgaard A. New operative technique to reduce surgeons' risk of HIV infection. *J Hosp Infect* 1991;18(suppl A):177-83.
- 66 Stotter AT, Guillou PJ, Vipond MN. The response of general surgeons to HIV in England and Wales. *Ann R Coll Surg Engl* 1990;72:281-6.
- 67 Hammond JS, Eckes JM, Gomez G, Cunningham D. Trauma and infection control: universal precautions are universally ignored. *J Trauma* 1990;5:555-61.
- 68 Callagher J, Strangeways JEM, Allt-Graham J. Contamination control in long-term ventilation. *Anaesthesia* 1987;42:476-81.
- 69 Shanson DC. Should surgical patients be screened for human immunodeficiency virus infection? *J Hosp Infect* 1991;18(suppl A):170-6.
- 70 Centers for Disease Control. Recommendations for preventing transmission of HIV and hepatitis B to patients during exposure prone invasive procedures. *MMWR* 1991;40:1-9.
- 71 Aboulafia DM. AIDS and surgery: risks and precautions. In: *Surgery*. Oxford: The Medicine Group (UK), 1992:89-93.
- 72 McEvoy M, Porter K, Mortimer P, Simmons N, Shanson D. Prospective study of clinical laboratory and ancillary staff with accidental exposures to blood or other body fluids from patients infected with HIV. *BMJ* 1987;294:1595-7.
- 73 National Blood Transfusion Service. *Guidelines for the blood transfusion services in the United Kingdom*. London: NBTS (in press).
- 74 United Kingdom Department of Health. *Occupational exposure to HIV and the use of zidovudine. A statement from the expert advisory group on AIDS*. Lancashire: Health Publications Unit, 1992.
- 75 Centers for Disease Control. Public health service statement on management of occupational exposure to human immunodeficiency virus, including considerations regarding zidovudine post exposure. *MMWR* 1990;39:RR-1.
- 76 Lange JMA, Boucher CAB, Hollak CEM, Wiltink EH, Reiss P, Van Royen EA, et al. Failure of zidovudine prophylaxis after accidental exposure to HIV-1. *N Engl J Med* 1990;322:1375-7.
- 77 Looke DFM, Grove DI. Failed prophylactic zidovudine after a needlestick injury. *Lancet* 1990;335:1280.
- 78 Darond DE, Le-Jeune C, Hugues FC. Failure of prophylactic zidovudine after a suicidal self-inoculation of HIV infected blood. *N Engl J Med* 1991;323:1062.
- 79 Tait DR, Pudifin DJ, Gathiram V, Windsor IM. Zidovudine after occupational exposure to HIV. *BMJ* 1991;303:581.
- 80 Jones PD. HIV transmission by stabbing in spite of zidovudine prophylaxis. *Lancet* 1991;338:884.
- 81 Jeffries DJ. Zidovudine after occupational exposure to HIV. *BMJ* 1991;302:1349-51.

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Whistle blowers

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The Helen Zeitlin affair¹ once again exposes the dilemma that an employee in public service faces in dealing with the conflict between responsibility to the employer under the contract of employment and disclosure of information which the employee believes to be in the public interest. Although the dilemma is most noticeable in public service it applies equally to employment in the private sector.

The decision of the secretary of state for health, Virginia Bottomley, to reinstate Helen Zeitlin, a consultant haematologist at Alexandra Hospital, Redditch, has been hailed as evidence of the government's professed desire for openness in the NHS. The case, however, highlights the difficulties for employees and the need for firmer policies and legal protection to ensure that whistle blowers are protected against victimisation after disclosing information which embarrasses their employer.

Helen Zeitlin publicly criticised the management of the hospital in which she worked. In doing so, she disclosed information on bed cuts and nursing levels at the hospital. She was subsequently made redundant. The health authority maintained that the hospital had too many specialists in disorders of the blood and her position at the hospital was redundant. But Helen Zeitlin asserted that she was dismissed as a direct result of her criticism of hospital management. She had, in her words, "become a thorn in its side."

Difficulties for whistle blowers

Whistle blowers in both the public and private sector are nothing new but came to public notice during the 1980s when Clive Ponting and Cathy Massiter disclosed information and documents which embarrassed the government—the so called Belgrano affair. Much political argument followed the criminal proceedings which resulted from the disclosures, and the government introduced greater restrictions on public servants' ability lawfully to disclose information to which they were privy through their employment.

In the health service the secretary of state has issued draft guidelines on whistle blowing. These provide that the whistle blower should take up any grievances internally. Even if the employee is dissatisfied after

taking those steps he or she could still be disciplined if information is made public.

The law in Britain at the moment helps the government to control whistle blowers. From the start the employees are put in a stranglehold. Implied terms are enshrined within the contract of employment which obligate an employee to act in good faith and fidelity. Disclosing confidential information breaches this term and can result in dismissal, leaving the employee to prove a case in the industrial tribunal. This is not attractive to an employee, especially when legal aid is not available for industrial tribunal cases.

The stranglehold can be more express. Terms prohibiting the disclosure of information acquired by an employee as a result of employment are standard. Many of the new hospital trusts are now including such a clause in contracts. Professional ethical codes can strengthen these restrictions—for example, those of the General Medical Council² and the University Funding Council.

Public interest

More and more employees are disclosing information that their employers consider confidential using the defence of public interest. The landmark case of *Initial Services Ltd v Putterill* in 1968 attempted to lay down guidelines for what is in the public interest. In essence, disclosure is in the public interest if the information pertains to serious misdeeds or serious risks to the welfare of the public and it is given to an appropriate recipient by the discloser in good faith. Establishing this defence is often difficult—for instance, who is an appropriate recipient? A newspaper?

Whether the disclosure is justified or not the employee is always in a weak position in relation to the employer. The employee risks both income and career whatever the nature of the information disclosed. There is very little protection against victimisation and eventually effective dismissal. Even if the employee can prove unfair dismissal before an industrial tribunal, the compensation is limited and little account is taken of the severe effects that dismissal and the circumstances can have on an employee's working life. In, for example, *Callanan v Surrey Area Health Authority*

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